

## TRIANGLES AND POLAR FORMS

### 1. TRIANGLE PROBLEMS

- (1) How many triangles with integer side lengths have perimeter 12?
- (2) Of the triangles in problem 1, which has the largest area?
- (3) What is the maximum number of intersection points of 8 circles?
- (4) What is the perimeter of a triangle with vertices at  $(10, 5)$ ,  $(-6, 3)$ ,  $(7, 4)$ ?
- (5) What is the circumradius of a 3–4–5 right triangle?
- (6) What is the area of a 4–6–9 triangle?
- (7) What is the inradius of a 5–12–13 right triangle?
- (8) What are the two possible third vertices of a triangle similar to a 3–4–5 right triangle with one vertex at the origin and one vertex at  $(1, 0)$ ?
- (9) What is the third vertex in a 7–8–9 triangle where one vertex is at  $(0, 0)$  and another is at  $(9, 0)$ ?
- (10) What is the third vertex in a 13–14–15 triangle where one vertex is at  $(0, 0)$  and another is at  $(14, 0)$ .

## 2. POLAR FORMS

- (1) Write two different representations of  $-4i$  in exponential coordinates.
- (2) Convert  $2 - 2i$  to exponential coordinates.
- (3) Convert  $\frac{7 + 7\sqrt{3}i}{2}$  to exponential coordinates.
- (4) Convert  $e^{\pi \cdot i}$  to rectangular coordinates.
- (5) Convert  $6e^{\frac{\pi \cdot i}{2}}$  to rectangular coordinates.
- (6) Convert  $3e^{\frac{\pi \cdot i}{6}}$  to rectangular coordinates.
- (7) What is the inverse of  $e^{\frac{\pi \cdot i}{2}}$  in exponential form?
- (8) What is the inverse of  $4e^{6i}$  in exponential form?
- (9) What is  $i^{2018}$ ?
- (10) What is  $(\sqrt{2} + \sqrt{2}i)^{2018}$ ?